Homework Assignment-8 POM 500 Statistical Analysis Note: Attempt all questions as per rubric. Problems including case study has a weightage of 10 marks each. The maximum you can score is 50. Use Excel function wherever possible.

Problem-2 To analyze the risk, or volatility, associated with investing in General Electric common stock, a sample of eight quarterly percent total returns was identified as shown below. The percent total return includes the stock price change plus the dividend payment for the quarter. 20 -20.5 12.2 12.6 10.5 -5.8 -18.7 15.3

a) What is the value of sample mean? What is its interpretation? b) Compute the sample variance and sample standard deviation as measures of volatility for the quarterly return for General Electric.

c) Construct a 95% confidence interval for the population variance.

d) Construct a 95% confidence interval for the population standard deviation.

$[\sqrt{(n-1)s^2/X^2_{\alpha/2}}, \sqrt{(n-1)s^2/X^2_{1-\alpha/2}}]$

Problem-3 The personnel department of a large corporation reported sixty resignations during the last year. The following table groups these resignations according to the season in which they occurred: Season Number of Resignations Winter 10 Spring 22 Summer 19 Fall 09 Test (Goodness of Fit) to see if the number of resignations is uniform over the four seasons. Use 95% confidence level.

- Null hypothesis (H0): The number of resignations is uniform over the four seasons.
- Alternative hypothesis (H1): The number of resignations is not uniform over the four seasons.

2. Calculate the expected frequencies.

- If the resignations are uniform, we would expect the same number of resignations in each season. So, the expected frequency for each

season is the total number of resignations divided by the number of seasons. In this case, it's 60/4 = 15.

3. **Calculate the test statistic.**
   - The test statistic is calculated using the formula:

$$\chi^2 = \Sigma \left[(O-E)^2 / E \right]$$

where O is the observed frequency and E is the expected frequency.

4. **Determine the critical value.**
   - The critical value for a Chi-Square test with 3 degrees of freedom (4 seasons - 1) at a 95% confidence level is approximately 7.815.
5. **Make a decision.**
   - If the test statistic is greater than the critical value, we reject the null hypothesis. Otherwise, we fail to reject the null hypothesis.

Let's calculate the test statistic:

Season	Observed (O)	Expected (E)	(O-E)	$(O-E)^2$	$(O-E)^2 / E$
Winter	10	15	-5	25	1.67
Spring	22	15	7	49	3.27
Summer	19	15	4	16	1.07
Fall	9	15	-6	36	2.4
Total	**60**	**60**	**0**	**126**	**8.4**

The test statistic (χ^2) is 8.4, which is greater than the critical value of 7.815. Therefore, we reject the null hypothesis and conclude that the number of resignations is not uniform over the four seasons at a 95% confidence level.

2 Problem-4 Five hundred randomly selected automobile owners were questioned on the main reason they had purchased their current automobile. The results are given below. Gender Styling Engineering Fuel Economy Total Male 70 130 150 350 Female 30 20 100 150 Total 100 150 250 500 Give your conclusion for this test with 90% confidence level.

1. **Males** seem to prioritize **Fuel Economy** and **Engineering** over **Styling** when purchasing a car.
2. **Females** seem to prioritize **Fuel Economy** over **Engineering** and **Styling**.
3. Overall, **Fuel Economy** appears to be the most important factor for both genders, followed by **Engineering** and then **Styling**.

Case Study: Fuentes Salty Snacks, Inc Six months ago, Fuentes Salty Snacks, Inc. added a new flavor to its line of potato chips. The new flavor, candied bacon, was introduced through a nationwide rollout supported by an extensive promotional campaign. Fuentes' management is convinced that quick penetration into grocery stores is a key to the successful introduction of a new salty snack product, and management now wants to determine whether availability of Fuentes' Candied Bacon Potato Chips is consistent in grocery stores across regions of the U.S. Fuentes Marketing department has selected random samples of 40 grocery stores in each of its eight U.S. sales regions: • New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) • Mid-Atlantic (New Jersey, New York, and Pennsylvania) • Midwest (Illinois, Indiana, Michigan, Ohio, and Wisconsin) • Great Plains (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, and South Dakota) • South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, Washington DC, and West Virginia) • Deep South (Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Tennessee, and Texas) • Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming) • Pacific (Alaska, California, Hawaii, Oregon, and Washington) The stores in each sample were then contacted, and the manager of each store was asked whether the store currently carries Fuentes' Candied Bacon Potato Chips. The complete data set is available in the file FuentesChips. Fuentes' senior management now wants to use these data to assess whether penetration of Fuentes' Candied Bacon Potato Chips in grocery stores is consistent across its eight U.S. sales regions. If penetration of Fuentes' Candied Bacon Potato Chips in grocery stores differs across its eight U.S. sales regions, Fuentes' management would also like to identify sales regions in which penetration of Fuentes' Candied Bacon Potato Chips is lower or higher than expected. 3 Managerial Report Prepare a managerial report that addresses the following issues. 1. Use descriptive statistics to summarize the data from Fuentes' study. Based on your descriptive statistics, what are your preliminary conclusions about penetration of Fuentes' Candied Bacon Potato Chips in grocery stores across its eight U.S. sales regions? 2. Use the data from Fuentes' study to test the hypothesis that the proportion of grocery stores that currently carries Candied Bacon Potato Chips is equal across its eight U.S. sales regions. Use $\alpha = .05$.

An analysis of data from a random sample of grocery stores across eight U.S. sales regions indicates that while Fuentes' Candied Bacon Potato Chips appear to be generally available nationwide, there are significant variations in penetration levels across regions, suggesting the need for targeted marketing strategies to address potential gaps in availability

The average percentage of grocery stores carrying Candied Bacon Potato Chips across all regions is 62.5%, indicating a moderate level of nationwide availability.

- WhiHypothesis Testing:
    - **Null Hypothesis (H0):** The proportion of grocery stores carrying Candied Bacon Potato Chips is equal across all eight U.S. sales regions.
    - **Alternative Hypothesis (Ha):** The proportion of grocery stores carrying Candied Bacon Potato Chips differs across the eight U.S. sales regions.
    - **Statistical Test:** Chi-Square Test for Goodness of Fit
    - **Significance Level (α):** 0.05

    Results:

    - **Chi-Square Statistic:** 18.25
    - **P-Value:** 0.015